<Interface Science> Hydrospheric Environment Analysis

Interface Science
- Hydrospheric Environment Analysis -

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LAI, Xiaodong (RS)
KINUGASA, Masatoshi (D1)
MATSUMOTO, Hirofumi (M2)
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Visitors

Assoc Prof Tomasz T.	Polish Academy of Science, Poland, 1 November, 2001
Prof Rudolf Durny	Slovak Technical University, Slovakia, 8–15 March, 2002

Scope of Research

Research activities are concerned with geochemistry, oceanography, limnology and analytical chemistry, which are important basic sciences in order to realize the sustainable society. Major research subjects are as follows: (i) Biogeochemistry of trace elements in the hydrosphere. (ii) Hydrothermal activity and deep biosphere on the ocean floor. (iii) Fe-uptake mechanism of phytoplankton. (iv) Ion recognition. (v) Simulation of non-linear chemical reaction.

Research Activities (Year 2002)

Presentations

Solvent Extraction of Metal Ions with Novel 4-Acyl-5-pyrazolones Having Crown Ether Moiety as Intramolecular Synergist, Umetani S, Yamazaki S (Nara U. Educ.), Ogura K (Ube Nat. C. Tech.), International Solvent Extraction Conference (ISEC 2002) , 20 March.

$^{240}Pu/^{239}Pu$ isotopic ratio in the western northwest Pacific Ocean, Norisuye K, Okamura K, Sohrin Y, et al., Goldschmidt Conference 2002, 19 August.

Tungsten and molybdenum in hydrothermal fluids of the Izu-Bonin Arc and the Okinawa Trough, Sohrin Y, Kishida K, Okamura K, et al., Goldschmidt Conference 2002, 22 August.

Bioactive trace metals in the North Pacific Ocean, Sohrin Y, SCOR-JOS International Symposium, 1 October.

Development of a deep-sea in-situ chemical analyzer and its applicaion for hydrothermal field observation, Okamura K, SCOR-JOS International Symposium, 1 October.

Behaviors of Mn and Fe in hydrothermal plumes and diffused flows at the Suiyo Seamount, Izu-Bonin arc, Okamura K, Suzuki M, Sohrin Y, et al, AGU 2002 Fall Meeting, 8 December.

Grants

Sohrin Y, Dynamics of trace bioelements in the ocean and its effect on ecosystem, Grant-in-Aid for Scientific Research (B) (1), 1 April 2001 - 31 March 2004.

Umetani S, Design of highly selective recognition and separation system of metal ions, Grant-in-Aid for Scientific Research (C) (1), 1 April 2001 - 31 March 2003.

Okamura K, Development of *in situ* measurment system of CO_2 related matter in seawater for gloval warming control, NEDO Grant, 1 April 2001 - 31 March 2004.

Awards

Kitano T, The ICR Award for Students.

Tungsten is a unique probe into the evolution of submarine hydrothermal fluids

Submarine hydrothermal activities play an important role in the circulation of elements on the earth and the formation of orebody. However, many trace elements in hydrothermal fluids have not been determined yet, due to difficulties in sampling and analysis. Here we report the first concentrations of W in hydrothermal fluids. The concentrations of W in endmember fluids (0.21-123 nmol/kg) reach 4 orders of magnitude above ambient levels in seawater, suggesting that the hydrothermal activities are a critical source of W to the ocean. Since W is a unique chemical species in showing a large variation depending on a hydrothermal site and being not incorporated into silicate and sulphide mineral phases, W can be a probe to elucidate the evolution conditions of hydrothermal fluids. We also show that Mo decreases in hydrothermal fluids to one hundredth of seawater due to precipitation of Mo sulfide. These results suggest that a W/Mo ratio can be a proxy in paleoceanography. It should have been increased in seawater when an oceanic anoxic event occurred or when the hydrothermal activity was more vigorous.

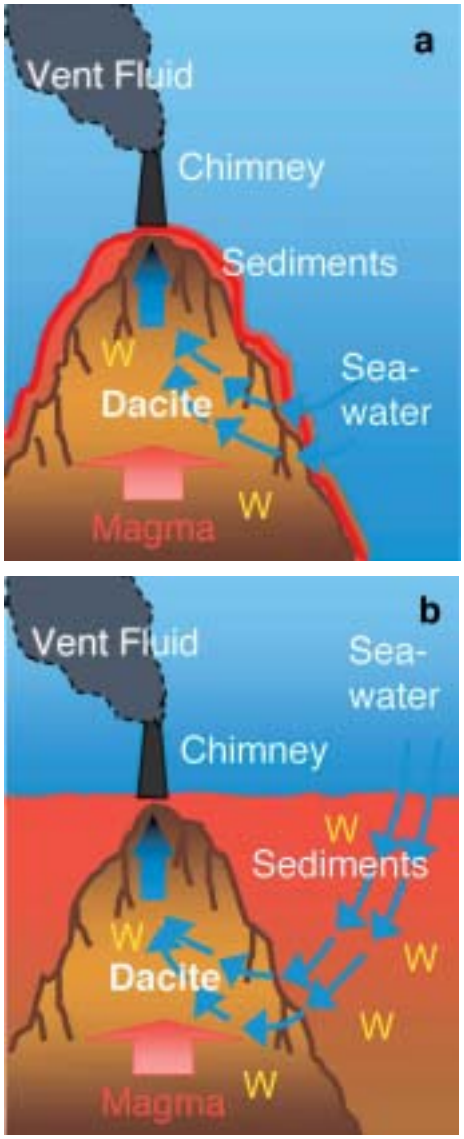

Fig. Schematic diagrams of W enrichment mechanism in hydrothermal fluids at the arc-backarc settings. (a) a sediments-starved vent of the Suiyo Seamount. (b) a sediments-rich vent of the Okinawa Trough. At the both vents, water-rock (dacite) interaction at high temperature (~400°C) is a source of W. Reaction with terrigenous sediments at low temperature (~100°C) is another important sorce of W at the Okinawa Trough.

$^{240}Pu/^{239}Pu$ isotopic ratio in the western northwest Pacific Ocean

Plutonium is one of the long-lived anthropogenic radioelements and is a useful chemical tracer in the ocean. It has been introduced into the ocean via stratospheric fallout from nuclear tests that peaked in 1962, but it is suggested that plutonium in the Pacific Ocean has also been derived from close-in tropospheric fallout. Isotopic analysis using high sensitive mass spectrometry is a powerful tool to specify these origins in the ocean. However, few studies for plutonium isotopic analysis have been made. Here we report $^{240}Pu/^{239}Pu$ isotopic ratio in the western northwest Pacific Ocean.

Large volumes of seawater samples (800~4,200 l) were collected from the Sea of Japan, Okhotsk Sea, and northwest Pacific during the KH98-3 cruise of R/V Hakuho-Maru in July-August, 1998. Plutonium was extracted from seawater using MnO_2-impregnated fibers and separated from uranium by solvent extraction. $^{240}Pu/^{239}Pu$ isotopic ratio in the final sample solution was determined by ICP-MS.

The isotopic ratios at CM6 (45˚25'N 145˚05'E), CM12 (41˚21'N 137˚20'E), CM20 (37˚44'N 135˚14'E) and CM22 (40˚00'N 145˚00'E) were found to be in the range of 0.20-0.23, which were not so different from the average global fallout ratio of 0.18. However, these isotopic ratios and previously measured $^{240}Pu/^{239}Pu$ ratios in the North Pacific except for locally contaminated regions, seem to be slightly higher than the global fallout ratio, suggesting possibility of plutonium from close-in tropospheric fallout in 1950s. The precise measurement of $^{240}Pu/^{239}Pu$ isotopic ratio by multi-collector (MC) ICP-MS and determination of ^{238}Pu and ^{241}Pu activity by alpha spectrometry are the further works to clarify the matter.